

REPORT ON ASBESTOS/CEMENT PIPE USE
AT
THE SAN GABRIEL VALLEY WATER COMPANY, CALIFORNIA

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Introduction

The San Gabriel Valley Water Company, located in El Monte, California, is the third of ten water systems studied under the Municipal Analysis Program of the A/C Pipe Producers Association. In this detailed site visit, as well as the other nine, the objective was to investigate the use of A/C pipe from every perspective. The broad functional categories covered by this fact-finding mission are as follows:

- Institutional
- Operational
 - Decisionmaking, Specification, and Procurement
 - Installation and Testing
 - Operation and Maintenance
 - Repair and Replacement
 - Detection and Prevention
- Financial

Each of these categories of information is discussed in detail in this report.

Background on the San Gabriel Valley Site Visit

The two day site visit to the San Gabriel Valley Water Company was conducted on January 11-12, 1982. Officials interviewed during the course of the visit included the following:

Ivan G. Holmberg, Vice President & General Manager
G. J. Black, General Superintendent
W. F. Gray, Distribution Superintendent
F. A. Lo Guidice, Chief Engineer
R. L. Watts, Purchasing Agent

Initially, Mr. Holmberg questioned carefully the purpose of the survey and the uses that would be made of the data. He also participated in most of the interviews, either directly or by

remaining in the room when others were being interviewed. However, both he and his staff participated fully in the survey and gave their time willingly. In general, they were quite pleased with the performance of A/C pipe although they did not express any particular interest in working further with the Association. This is not unusual since they do not participate in AWWA or other associations.

Institutional and Background Information

The San Gabriel Valley Water Company is a subsidiary of the Utility Investment Company of Nevada, a privately owned utility holding company. San Gabriel dates from 1935 and has grown steadily over the years. In 1979, it purchased the Arizona Water Company for \$5.6 million.

San Gabriel is divided into two districts: Los Angeles County and Fontana. Jointly, they serve about 210,000 persons with 60,000 service connections with 125 mgd of water (including untreated water sold for irrigation of cropland). About 70 percent of the raw water supply is groundwater, with the remaining 30 percent drawn from surface waters purchased from the Metropolitan Water District of Southern California (MWDSC). The groundwater is chlorinated only; surface water is filtered and chlorinated. In both cases, the waters can be classified as non-aggressive. The MWDSC obtains its surface water supply from the California Aqueduct, which conveys water from the Colorado River to Southern California.

Of the two divisions, L. A. County is by far the largest. San Gabriel's overall management is located in El Monte, which is also the headquarters for L. A. County operations. However, the majority of the system's annual growth rate of 1000 connections is occurring in the Fontana service area. Major engineering decisions, such as pipe purchasing, are made largely by Mr. Holmberg and apply to both divisions. A copy of the Company's organization chart is attached.

The Los Angeles County Division is divided into five operating groups headed by the General Superintendent, Jerry Black. Bill Gray is chiefly responsible for the 14 man group that handles maintenance of the distribution system including main break repair.

San Gabriel is a regulated public water utility under the jurisdiction of the California Public Utilities Commission (PUC). It is required annually to submit a report to the PUC providing separate and combined financial data for the L.A. County and Fontana districts. A complete copy of the system's 1980 PUC report was provided at the time of the site visit.

The Transmission and Distribution System

The San Gabriel system is a heavy user of A/C pipe, having

about 450 miles of A/C, 240 miles of cement lined and coated steel, 40 miles of iron pipe and 1 mile of PVC. The steel pipe is used largely for lines larger than 16 inch diameter, and for those lines laid within 10 feet of a sewer or under roadways or rail lines. The 1980 PUC report lists the footage of A/C by size as follows:

<u>Pipe Diameter (inches)</u>	<u>Feet Installed</u>	<u>Percent of Total</u>
3	446	>0.1
4	372,443	16.1
6	1,008,874	43.7
8	496,238	21.5
10	282,027	12.3
12	84,523	3.7
14	26,257	0.6
16	46,660	2.0
18	1,313	>0.1

The usage distribution of pipe materials also is detailed in the PUC report:

<u>Pipe Material</u>	<u>Amount (feet)</u>
cast iron	23,815
cast iron (cement lined)	216,784
concrete	10,477
copper	632
riveted steel	106,206
standard screw	255,148
screw or welded casing	332,678
cement asbestos	2,307,246
welded steel	1,137,652
plastic	4,515
TOTAL	4,345,203

As of December 31, 1980, A/C comprised 53.1 percent of the total footage. Steel pipe was second with 42 percent of the system. Cast iron footage is minimal and is not growing. Some PVC is used, usually in very small sizes (2 inch), but Holmberg showed little inclination toward expanding the system's use of PVC. In fact, he cited a recent incident at the Arizona Water Company where PVC pipe was substituted for an A/C pipe order by the supplier. Although the substitution was ultimately accepted, it resulted in a policy specifically banning such changes in the future.

Service connections usually are installed with polybutylene pipe. Some problems have been experienced with these, related to faulty resins manufactured in 1974-1975. However, the system continues to use this material, but the quality of pipe received is monitored carefully.

Most of the cast iron in the system is older pipe which has experienced some problems with internal and external corrosion. San Gabriel has found that cement lining and wrapping of steel pipe is adequate protection under their conditions of mildly aggressive water and soils. They attribute the excellent performance of A/C in the system to the quality and integrity of the pipe, plus close control of contractor-installers.

OPERATIONS

Specification, Decisionmaking, and Procurement

San Gabriel purchases pipe directly from the suppliers on an annual contract basis, with supplemental purchases as required. The system contracts out the installation to a select group of contractors, who pick up the required materials from the Company's supply yards. Installation contractors are required to have extensive experience with pipeline construction and they must be prequalified for the system's approved bidders list. There are currently 6 approved contractors on this list. As an added incentive to attract competent contractors, the system stresses prompt payment of contractor invoices, forwarding payment within 15 days of billing.

San Gabriel
In lieu of writing highly detailed specifications which can then be bid by all nominally qualified pipe suppliers and contractors, the system exercises a high degree of selectivity for both pipe suppliers and installers. Bidding is highly restricted as a means of maintaining quality control and also to standardize the materials and construction techniques within the system. Only two A/C pipe manufacturers, Johns-Manville and Certain Teed, are allowed to bid A/C pipe; foreign manufacturers are specifically excluded. Materials and installation specifications are written around the applicable ASTM and AWWA standards, plus those of J-M and Certain Teed. In 1981, the latter was the sole source supplier of pipe used by San Gabriel.

Within the boundaries of the limited and rigorous prequalification procedure, purchasing decisions are made based on the price quoted by the lowest bidder. A/C pipe has been found by San Gabriel to be highly competitive in sizes up to and including 16 inches. Consideration is being given to using larger A/C pipe more extensively because of non competitive conditions in the steel pipe market. System officials noted that U.S. Steel has a "virtual monopoly" in many of the larger steel pipe sizes.

Design Considerations

For the most part, San Gabriel uses Class 150 A/C pipe in the valley portions of its service area where system pressures range from 70-80 psi. Hillside areas can have pressures as high as 125 psi and sometimes require the use of Class 200 pipe. The standard design practice requires 30 inches or more of cover. Where possible, the pipe network is looped to avoid dead end and

stagnant conditions. Other design requirements largely parallel those suggested by J-M and Certain Teed. Truck delivery of pipe is required and material is carefully inspected when received.

Installation and Testing

Contractors are required to install A/C pipe in accordance with the AWWA C603 standard. To facilitate pipe location, the system requires the installation of 18 gauge copper wire on the top center of the pipeline. Pipe is normally installed in the shoulder of or immediately adjacent to roadways because some problems have occurred from tree root intrusion into pipe that is installed in yards, greenspaces, and parklands. Holmberg has a laminated tree root with an ingrown corporation stop in his office. It is labeled, "Automatic Corp Stop Remover." This display received an AWWA award in 1970.

With only two exceptions in recent years, San Gabriel has assumed direct control and responsibility for all pipe installations within its service area. System officials noted they can install pipe at a lower cost than developers can and with fewer ensuing problems.

Data on the amount of A/C and steel pipe installed annually since 1970 was also provided and is tabulated below. The rate of increase of A/C pipe usage has been relatively flat in the L. A. County Division, but continues to increase sharply in the Fontana Division, reflecting continued strong growth of the service area. Steel pipe is retaining a minor percentage of the total, particularly in the Fontana system.

Year	Los Angeles County		Fontana	
	A/C	Steel	A/C	Steel
1970	21,697	25,421	19,406	7,451
1971	18,739	21,629	47,117	4,696
1972	25,859	5,502	16,403	710
1973	23,341	14,154	28,213	9,945
1974	22,801	1,845	19,768	204
1975	19,606	4,470	17,403	90
1976	27,893	9,635	28,814	80
1977	27,134	3,304	17,624	213
1978	39,938	3,370	72,082	633
1979	37,555	15,872	58,490	207
1980	23,961	13,133	65,247	15,802
1981	17,945	12,429	67,049	4,512

Virtually all of the A/C pipe is accounted for by 6, 8 and 10 inch diameter pipe. At the Los Angeles County Division, 8 inch pipe is used most frequently, followed closely by 6 inch. The reverse is true at Fontana, where 6 inch pipe predominates. In 1980 for example, 8 inch A/C pipe installed in the L.A.

County Division accounted for 47.3 percent of the total A/C footage, versus 17.4 percent for 6 inch and 15.8 percent for 10 inch. At Fontana, 6 inch pipe accounted for 49.5 percent of the total A/C footage, versus 28.7 percent for 8 inch and 16.6 percent for 10 inch.

Although the sharp upward trend in pipe usage by this utility has flattened out somewhat, it will continue to purchase significant quantities of pipe each year. A/C pipe is highly price competitive and, as detailed later, an outstanding performer in this system. Also, the A/C pipe and health issue has not been particularly active. Mr. Holmberg noted that the most interest occurred one or two years ago when they received several calls from water customers.

Pipe Handling Procedures

Contractors are expected to follow handling procedures recommended by the pipe manufacturers. The contractor is responsible for any damage to the pipe after it is picked up at the Company's supply yard. San Gabriel requires truck shipment of the pipe. Rail shipment is not allowed. Field machining of the pipe is avoided by using MOA sections where needed.

Trenching, Bedding, and Backfilling

Minimum trench width specified is 18 inches for pipe of 8 inch or less diameter. Trenches for larger pipe must exceed the nominal diameter of the pipe by 12 inches. Minimum cover requirements are as follows:

<u>Pipe Size</u>	<u>Depth of Top of Main From Flow Line of Gutter</u>
4" - 6"	36"
8"	42"
10"	46"
12" & Larger	48"

Sand backfilling is required only where the trench has been overcut. Otherwise, the specification only forbids backfilling with rocks or lumpy material greater than 3 inches in diameter closer than 12 inches to the pipe. Compaction is by water jetting after the trench has been backfilled to within 12 inches of the surface.

Tapping

San Gabriel allows direct tapping and threading of A/C pipe with the following restrictions:

1. No 3/4 inch taps are allowed on 4 inch A/C.
2. No one inch taps are allowed on 4 or 6 inch A/C.

3. No direct taps are allowed on Class 100 A/C pipe regardless of size.
4. Where direct taps are not allowed, tapping saddles are required.

Wet tapping is normally performed using a Mueller purged tapping machine. In the early 1950's, the system used pretapped couplings but experienced sand fouling of the taps.

Disinfection and Pressure Testing

A/C pipe at San Gabriel is pressure tested per AWWA specifications. No special requirements are imposed in addition to AWWA specs. Contractors are responsible for mainbreaks on newly installed pipe. Attached is a copy of the Company's standard pressure test table. Disinfection and flushing are required as per AWWA standards, local health regulations, and manufacturers' recommendations.

Recommended Work Practices

Contractors are responsible for following OSHA approved methods for working with A/C pipe. San Gabriel does not train contractors on safe methods of cutting and machining A/C pipe and does not require them to use approved tools other than for hot tapping. Mr. Holmberg was not aware of any AACPP publications on Recommended Practices. He requested that the Association send him 12 copies of the booklet.

Operation and Maintenance

San Gabriel does not collect and analyze main break data. The reason given for this is that the frequency of breaks is so low that the effort is not justified. Mr. Holmberg noted that breaks in the system average about one per month for A/C, and two per month for metallic pipe (cast iron and steel). For the most part, A/C breaks are caused by contractor error during construction of adjacent storm drains or other utilities. Another cause of main breaks is intrusion of tree roots where the pipe passes through greenspace. Current installation practices note the location of trees and avoid such areas as parkways when possible.

Mainbreaks are repaired using stainless steel repair clamps. Usually, repairs are made by the system's own repair crews, though contractors may be called in on the larger breaks. The comment was made that A/C breaks tend to be quite large as the pipe will often crack or break across its entire cross section when it fails. San Gabriel's 1980 PUC report shows an expenditure of less than \$170,000 for maintenance of transmission and distribution mains.

Total unaccounted for water in the system is about 4 per-

cent, including fire flows, street cleaning, contractor usage, and losses from broken mains. Purchased and pumped water is metered carefully and compared with metered water sales to arrive at the 4 percent figure. Because water loss is so low, there is no formal leak detection and repair program in operation and none is contemplated at this time.

Mr. Holmberg cited service connection failures and improperly set or stuck valves as the system's principal maintenance problem. The maintenance department has a program of checking valves and taps and has found numerous conditions of incorrectly closed valves and leaking or partially open taps. He also noted that there are no problems with declining flow coefficients with the system's pipe. Rather, flow problems occur where existing mains are not large enough to handle current demands.

A/C pipe has performed very well throughout the system. It has survived minor earthquakes without breakage and San Gabriel managers consider it superior in all regards with the exception of beam strength. Mr. Holmberg noted his belief in the flexibility of A/C pipe in earthquake situations and stated a strong preference for 13 foot pipe lengths and rubber ring sealed couplings. He also stated. "if A/C does have a fault, it is brittleness--we get large breaks." He emphasized the low cost, ease and economy of installation, superior earthquake performance, and immunity to corrosion as the primary reasons why San Gabriel will continue to install A/C pipe.

FINANCIAL

The San Gabriel Valley Water Company appears to be a financially healthy and well managed organization. Total operating expenses in 1980 were just under \$7 million. Operating revenues, including metered water revenues, fire protection charges, and irrigation amounted to \$10.56 million. Net income after interest expense and taxes was \$1.65 million, a 15.6 percent return on sales. Bonded indebtedness as of the end of 1980 was \$11 million, which was 36 percent of the water plant value of \$30.5 million. Pipe is depreciated on a 50 year schedule.

Where developers do not install system extensions (the usual case), they contribute to the cost of any extension. In turn, they are refunded 22 percent of gross revenues from the new service area until the initial contribution is refunded. This is a California PUC requirement. San Gabriel also finances system extensions out of retained earnings.

San Gabriel managers believe they are purchasing and installing pipe in a very cost effective manner. They provided the winning bid data for their major 1981 A/C pipe purchase tabulated on the next page:

<u>Size</u>	<u>Approx. Quantity</u>	<u>Price, \$/ft.</u>	
		<u>Class 150</u>	<u>Class 200</u>
4"	1,500'	2.05	2.28
6"	25,000'	2.87	3.30
8"	25,000'	4.24	4.61
10"	12,000'	6.21	7.22
12"	3,000'	8.07	9.43
14"	500'	9.92	10.98
16"	1,500'	12.06	14.00

These prices include delivery to the El Monte supply yard. No installation cost data was provided. No bid data was provided for steel, PVC, or ductile iron pipe. System officials stated that A/C is quite cost competitive up to 16 inches in size and is becoming more so in the larger sizes due to monopolistic conditions in the steel pipe market.

CONCLUSIONS

San Gabriel has had outstanding experience with A/C pipe. The very low main break and leakage rates speak well for the pipe and the system's installation practices. System managers are enthusiastic in their praise of A/C pipe and obviously expect to make it their first choice in the future. Moreover, uncompetitive supplier conditions in the larger diameters, where steel pipe is currently being used, present a marketing opportunity for suppliers of A/C transmission pipe.

This very well managed utility is a perfect example of the attributes of A/C pipe that can be portrayed effectively in product advertising based on case studies. It is recommended that the Association seek approval from San Gabriel (through Ivan Holmberg) for a case history advertisement which could be published in the AWWA Journal, Public Works, or other major trade journals.